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Roach et al.

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(54) **ROTATING CONCAVE EDDY CURRENT PROBE**

6,014,024 A * 1/2000 Hockey et al. 324/240
6,636,037 B1 * 10/2003 Ou-Yang 324/240
7,301,335 B2 * 11/2007 Sun et al. 324/240

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FOREIGN PATENT DOCUMENTS

GB 2273782 * 6/1994
JP 411148876 * 6/1999
WO WO 2007/015705 A3 2/2000

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* cited by examiner

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(52) **U.S. Cl.** **324/240; 324/242; 324/228**

(58) **Field of Classification Search** 324/222, 324/228, 234–243

See application file for complete search history.

(57) **ABSTRACT**

A rotating concave eddy current probe for detecting fatigue cracks hidden from view underneath the head of a raised head fastener, such as a buttonhead-type rivet, used to join together structural skins, such as aluminum aircraft skins. The probe has a recessed concave dimple in its bottom surface that closely conforms to the shape of the raised head. The concave dimple holds the probe in good alignment on top of the rivet while the probe is rotated around the rivet's centerline. One or more magnetic coils are rigidly embedded within the probe's cylindrical body, which is made of a non-conducting material. This design overcomes the inspection impediment associated with widely varying conductivity in fastened joints.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,399,968 A * 3/1995 Sheppard et al. 324/242

20 Claims, 20 Drawing Sheets

